Emotion Regulation and Anxiety Disorders

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Abstract

Recent attention has been given to the role of emotion regulation in the development and maintenance of psychopathology. Gross (1998) provided a framework from which to understand emotion regulation processes, and it is within this framework that the literature on emotion regulation/dysregulation in the anxiety disorder population is reviewed, with a focus on possible deficiencies that lead to or maintain the disorders. The present paper aims to (1) briefly introduce emotion regulation strategies of suppression and reappraisal; (2) summarize the empirical studies of emotion regulation within anxiety disorders; (3) discuss the neurobiological markers of emotion regulation within these disorders; (4) provide future directions for research; and (5) summarize possible treatment implications resulting from this important area of research.

Emotions and Emotion Regulation

Emotions have been studied with great interest from the inception of the field of psychology including such notables as James, Freud and Darwin (Gross, 1998). This attention has been given for good reason; there is no doubt that emotions serve numerous functions, such as an evolutionary function (Tooby & Cosmides, 1990), a social and communicative function (e.g., Ekman, 1993), and a decision making function (Oatley & Johnson-Laird, 1987), among others. While emotions can be adaptive in many ways, emotions can also be maladaptive; delineating between the two is a key goal of affective science, a rapidly growing field. As a result of growth, researchers have begun to define key constructs used across studies. Affect, emotion, and mood are no longer terms used interchangeably; they are now differentiated conceptually and empirically. This newly agreed upon nomenclature allows for literature synthesis, enhancing further understanding of affective science. Affect refers to the superordinate class for all valenced conditions (Rottenberg & Gross, 2003). Emotions, a subtype of affect, are flexible response sequences elicited by internal or external events appraised as relevant to an organism's well-being (Gross). Emotions are multidimensional, consisting of experiential, behavioral, and physiological components (Lang, 1994). For example, the emotion of fear may include feelings of uneasiness, escape attempts, and a racing heart. Moods refer to a combination of affective responses that last for a longer period of time compared to emotions, which are relatively transient (Rottenberg & Gross, 2003).

Individuals differ in emotion specific behavior (Davidson, 1998). Various emotional components (i.e., experiential, behavioral, physiological) may not be the same within the same individual. For example, one may have a low tolerance for anger and therefore subjectively

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report experiencing high levels, whereas physiologically, they may not appear angry (i.e., no increase in heart rate). This implicates the need for multimodal assessment of emotion, such as use of self-report, physiological measures, and objective behavioral measures such as facial coding. Davidson reported that individuals differ on certain components of emotional responding including threshold for emotion elicitation, amplitude of emotional response, rise time to peak, and recovery time. These aspects compose what Davidson refers to as affective chronometry, which he views as intrinsic to the understanding of psychopathology. Another variable of which individuals differ is that of acceptance of emotions. Self-judgment of emotions may deem them appropriate or excessive, acceptable or intolerable, comprehensible or nonsensical.

Increased attention in affective science has also led to findings that further the understanding of emotions, rendering many previously held views erroneous. For example, emotions were previously believed to be independent and automatic, similar to fixed action patterns (Solomon, 1976), and are now thought to be flexible and controllable. In fact, many methods of exertion of control over emotions have been demonstrated (Gross, 1998). The most well received definition of the term emotion regulation refers to methods of influence relating to the experience and expression of emotions, as well as the times in which emotions occur (Rottenberg & Gross, 2003). An important aspect of this definition of emotion regulation is that it occurs within the individual; other definitions, especially those within the developmental literature posit that emotion regulation can include extrinsic forces, including other people's effects on one's regulation (e.g., Thompson, 1994). Empirical research has demonstrated that emotion regulation techniques may be employed automatically or purposely, and further can be conscious or unconscious (Gross). Rather than a strict dichotomy, it may be more correct to conceptualize a continuum from conscious and purposeful to unconscious and automatic. Davidson (1998) asserted that emotions are rarely generated without accompanying regulatory processes; in other words, emotion regulation is an inherent aspect of emotional response tendencies. This intrinsic connection between emotion generation and regulation creates a blurry boundary as to when one ends and the other begins. While some argue that emotion generation and regulation are inextricably entwined (e.g., Thompson), developments in methodology appear otherwise (Rottenberg & Gross).

As there is an emotion generation process, meaning that emotions develop over time rather than appearing in full-force, there are many opportunities for modification (Gross, 1998). A broad distinction can be made between antecedent-focused and response-focused regulation strategies. Antecedent-focused strategies occur early on in the emotion generation process, before the emotion has been fully generated. Typically, the early intervention of antecedent-focused strategies allow for alteration of the emotional trajectory, influencing both the experience and subsequent expression of the emotion. The most commonly studied antecedent-focused strategy is termed reappraisal, which refers to alteration of the way one thinks about a situation to alter its emotional impact. Conversely, response-focused emotion regulation strategies occur later in the emotion generation process, and thereby allow fewer opportunities for intervention. As the emotion is fully generated, response-focused strategies tend to focus on alteration of the expressional component of the emotion, rather than the experiential and physiological components. In comparison to antecedent-focused strategies, response-focused strategies are less likely to modulate the experiential component of emotion (Gross & John, 2003). Response-focused strategies may have undesired and unintended effects on the physiological and experiential components of the emotion. Suppression, the most frequently investigated response-focused strategy, refers to attempts to ignore the emotion that has developed and avoid its expression.

Various emotion regulation strategies differentially effect the three components of emotion, some more efficaciously than others (Lazarus & Opton, 1966). For example, participants were

exposed to an evocative film; one group was instructed to mask the experience of emotion (i.e., suppress) and one group received no such instructions. While participants in the suppression group were able to effectively hide their emotional experience, subjective and physiological measures indicated they were experiencing negative emotions at a higher degree than participants not using suppression (Gross & Levenson, 1997). Suppression and reappraisal were directly compared using an upsetting film clip (Gross, 1998). Participants were either instructed to use suppression to act in an unemotional fashion, or to use reappraisal to change the way they thought about the film in order to alters its emotional impact. Both suppression and reappraisal successfully decreased the expressional component of emotion, but only reappraisal lowered the experiential component.

Emotion regulation, in its many forms, is pervasive applying to all aspects of life from an early age. In fact, there is evidence that infants can learn to exert control over their emotions through behaviors such as approach, avoidance, or attention deployment (Rothbart & Ahadi, 1994). Further, emotion regulation is part of the socialization process. For example, children are taught to exhibit joy and surprise when opening gifts in the presence of others, despite their true reactions. This degree of social appropriateness continues later in life too; when asked how they are doing most adults despite their true state will smile and report that they are fine (Gross, 1998). As emotion regulation is so much a part of everyday life, it is not surprising that disturbances in emotions and regulation thereof can result in despondency or even psychopathology. In fact, review of the Diagnostic and Statistical Manual of Mental Disorders 4th edition ([DSM-IV]; American Psychiatric Association [APA], 1994) reveals that over 50% of Axis I disorders and 100% of Axis II disorders implicate emotion regulation deficiencies (Gross & Levenson, 1997). Moreover, within some disorders, specific criteria refer to emotion regulation impediments (Kring & Werner, 2004). Two examples can be taken from anxiety disorders; in Posttraumatic Stress Disorder (PTSD) "efforts to avoid feelings" is a criteria, and "difficulty controlling worry" is a criteria for Generalized Anxiety Disorder (GAD).

Anxiety Disorders

Anxiety disorders are the most prevalent classes of mental disorders (Kessler et al., 1994). According to Barlow (1991), anxiety disorders are essentially ailments of emotion. Thayer and Lane (2000) also posited a definition of anxiety disorders that directly implicates emotion. They asserted that anxiety disorders represent a failure to either elect an adaptive response or to inhibit a maladaptive response given a situation. Anxiety is a state of diffuse arousal following the perception of a real or imagined threat. This fundamentally experiential, future-oriented, self-focusing emotion at times can be adaptive, as anticipatory problem-solving thoughts are triggered (Barlow). Yet, anxiety can also consume attentional resources and lead to feelings of helplessness and withdrawal. Anxiety disorders, while being a diverse set of phenotypes, are alike in that they all involve excessive negative affect typically in the form of fear and anxiety. Davidson's (1998) concept of affective chronometry is related in that the emotions in anxiety disorders are not maladaptive in and of themselves. It is the timing and intensity of negative emotions within these disorders that appears to be problematic (Kring & Werner, 2004). Therefore it is no surprise that emotion regulation deficiencies are likely associated with these disorders. What is surprising is that although there is a plethora of research on emotion regulation in nonclinical populations, research in clinical populations is scarce.

Individuals differ in the extent to which they accept their emotions (Gross & John, 1995; 1998). These appraisals are related to psychopathology in two important ways (Gross & Munoz, 1995). First, they contribute to the extent to which emotions are deemed to be aversive. Perception of certain emotions as aversive is further associated with other disorder related behavior such as avoidance and social withdrawal. Second, appraisal of emotions is related to subsequent regulation attempts. If an emotion is considered to be aversive or undesirable it is

more likely to be the target of regulation than is an emotion deemed nonaversive or desirable. Moreover, regulation strategies may not always be efficacious, and they may even produce undesirable effects (Gross & John, 2003). In other words, if an emotion is deemed aversive and the individual engages in emotional suppression, for example, it is likely that the experience of the emotion may increase rather than decrease. It should be noted that overall valence of the emotion does not necessarily determine its level of acceptance. All individuals may not consider negative emotions such as sadness, fear, or anger unacceptable.

In individuals with anxiety disorders certain emotional states may be more aversive than others. For example, a well-accepted model of panic disorder is built around the tenant of these individuals having a "fear of fear" (Barlow, 2000). Therefore, the emotion of fear is deemed unacceptable and negative evaluations are made. Following, regulation strategies may be employed to avoid the possible elicitation of fear, or once fear is generated emotion regulation strategies may be attempted to squelch it. Further, judgments anxiety disordered individuals make regarding their internal states, including emotions, thoughts, and physical sensations may serve to confirm misinterpretations of standard autonomic arousal, thereby furthering disproportionate attempts at regulation (Barlow). In comparison to healthy controls, individuals with an affective disorder report less acceptance of their emotions, less emotional clarity, and more attempts at emotion regulation (Campbell-Sills, Barlow, Brown, & Hofmann, 2003).

Evidence of Emotion Regulation Disturbances in Anxiety Disorders

Specific Emotion Regulation Strategies

Suppression—By far the most oft-studied regulation technique within clinical populations is suppression, which is conceptualized as an avoidance strategy. Results from experimental investigations not only speak to the maladaptive nature of suppression, but also provide evidence of its relation to anxiety disorders. Lynch, Robins, Morse, and Krause (2001), through structural equation modeling in a clinical sample, found that suppression attempts mediated the relationship between intensity of negative affect and psychological distress.

Suppression has been studied in many anxiety disorders, including PTSD. In a sample of Vietnam veterans with and without PTSD emotional suppression questions were embedded into a structured interview of symptomotology (Roemer, Litz, Orsillo, & Wagner, 2001). Those with PTSD were found to utilize suppression more often and with more effort than were those without PTSD. Furthermore, regularity of suppression use was related to severity of PTSD symptoms. Interestingly, PTSD participants reported suppressing both positive and negative emotions more so than did non-PTSD participants. As suppression of positive emotion not only decreases the expression component, but also decreases the experiential component (Gross & John, 2003), suppression in this population may dampen positive emotion experiences thereby contributing to the increased risk of development of depressive symptoms associated with this disorder (APA, 1994). It appears that PTSD participants' attempts at emotion regulation were ironically furthering their symptoms.

In another Vietnam veteran study, individuals with and without PTSD were primed with a negative or neutral video and subsequently exposed to slide images categorized as positive, neutral, or negative (Litz, Orsillo, Kaloupek, & Weathers, 2000). Emotional reaction to the slides were assessed via autonomic activity, facial reactivity, and self-report. The PTSD group exhibited higher heart rate throughout the experiment than non-PTSD group. There was no group difference to neutral or negative stimuli following the negative prime, but the PTSD group exhibited less facial response to positive stimuli. The authors suggested that the higher heart rate in those with PTSD in response to both types of stimuli represented an automatic preparation for threat, but in fact, it could have represented suppression attempts. It has been

demonstrated that suppression increases physiological reactivity (Gross & Levenson, 1997). Further, those with PTSD have been found to use suppression to attempt to control emotional experiences. Taken together, it can be conjectured that those with PTSD may have been using suppression thereby accounting for their higher reports of emotion and higher heart rates. Future studies should investigate this possibility.

Campbell-Sills and colleagues (2003) compared spontaneous emotion regulation in a group with a mood or anxiety disorder to a nonclinical sample. Questionnaire data indicated that the clinical group was less accepting of their emotions, and used suppression more often, than did the nonclinical group. Participants were shown a negative emotion eliciting film and their unprompted emotion regulation strategies were assessed, as was resulting emotional arousal, distress, and physiological arousal. Clinical participants used suppression more than nonclinical participants during the film and subsequently displayed a higher heart rate. The groups did not differ on reported emotional arousal or distress, but the clinical participants deemed their emotions as less acceptable. Campbell-Sills et al. also examined intentional emotion regulation within the clinical sample. In this study half of the participants were instructed to suppress their emotions while the other half were instructed to accept their emotions. Results indicated that the suppression group faired worse than the acceptance group in terms of subjective distress; furthermore, the suppression group displayed an elevated heart rate that persisted after the film was over, in comparison to the acceptance group.

Biological challenge paradigms have also been utilized to induce anxiety in order to study the effects of suppression. Nonclinical participants, classified as high or low emotional avoiders, were exposed to four trials of inhalation of 20% carbon dioxide-enriched air (Feldner, Zvolensky, Eifert, & Spira, 2003). Participants were randomly assigned to one of two experimental conditions, a suppression group (i.e., instructed to suppress feelings of panic and bodily sensations) or an observation group (i.e., instructed to notice feelings and bodily sensations). A group difference was found despite experimental condition in that high avoiders reported more distress and anxiety than did low avoiders. High avoiders also reported more anxiety in the suppression condition than did low avoiders. No main effect for condition was found, yet an interaction between group and condition was significant suggesting that high avoiders experienced more averse effects from suppression than did low suppressors.

Also using a carbon dioxide challenge, Levitt, Brown, Orsillo, and Barlow (2004) compared the effects of two emotion regulation strategies. Panic disorder participants were exposed to one of three 10-minute tapes describing suppression, acceptance, or a neutral narrative. A 15-minute carbon dioxide challenge was then undertaken. Those in the suppression group reported more anxiety than did those in the acceptance group. Further, those in the acceptance group were more willing to participate in a second challenge than were participants in the other groups. Surprisingly, the suppression group did not differ from the control group. Given that individuals differ in the extent to which they attempt to avoid emotions (Hayes, Stroshal, & Wilson, 1999), this may affect how they employ different regulation techniques (Gross & John, 2003). Individuals with anxiety disorders, such as those participants with Panic Disorder in Levitt et al.' s study, are likely to be high in avoidance. Not surprisingly, individuals with greater tendencies to avoid emotions have been found to attempt to employ emotion regulation techniques falling under the avoidance category, such as suppression, to a greater degree than those low in trait avoidance (Hayes et al.). In other words, anxiety disordered participants in this study who were assigned to the neutral condition may have naturally using avoidance techniques, such as suppression; however, this is an empirical question. Therefore, future studies should control for differences in one's trait tendency to avoid emotions or include a validity check to ensure that the neutral condition was in fact devoid of regulation attempts. It cannot be ascertained from the data that those in the neutral condition were not in fact

attempting to use suppression, which may explain the lack of group difference between the neutral and suppression groups.

There is not conclusive data regarding the causal role of suppression may play in the development of anxiety disorders; however, a larger wealth of data exists that lends itself to the conclusion that suppression may maintain symptoms. Generally, two models have been posited regarding the development of symptoms. First, it is possible that anxiety disordered individuals engage in more suppression attempts because they have greater levels of negative emotion to attempt to regulate. In this model, suppression attempts may be in part increasing symptoms, but suppression attempts are not the original cause of the emotions or symptoms. Alternatively, suppression attempts have been conjectured to be causal. Disproportionate attempts to regulate emotions may lead to unintended increases in the very emotions intended to be regulated (Gross & Levenson, 1997). In individuals with anxiety disorders, this may effect may be heightened. For example, Craske, Miller, Rotunda and Barlow (1990) found that in a treatment seeking population, the level of reported agoraphobic avoidance after the first panic attack predicted the development of subsequent anxiety disorders. Specifically, high avoiders were more likely to develop anxiety disorders than were low avoiders. Barlow, Allen and Choate (2004) suggested this finding is related to regulation attempts in that high avoiders ineffectually apply regulation strategies. Mennin, Heimberg, Turk, and Fresco (2002) have posited an emotion regulation model of GAD congruent with Craske et al.'s findings. They proposed that individuals with GAD not only have emotion generative processes more intense than most, but also have deficiencies in altering their emotional experience. They posited that intense regulatory efforts are instigated, typically worry or suppression, leading to opposite of intended results (i.e., increases in anxiety rather than decreases in anxiety). Empirical support for the model was found (Mennin, 2004).

Mixed data exists regarding the usefulness of treatment techniques that promote suppression of emotion. Schmidt and colleagues (2000) conducted a dismantling study of a treatment for panic disorder and found that not only did the addition of breathing retaining aimed at avoidance of emotion not add to the efficacy of the treatment, it was associated with worse outcome than exposure and cognitive restructuring alone. Furthermore, Barlow and colleagues (2004) concluded that distraction techniques employed by those with anxiety disorders are not effective and have counterproductive effects. Alternatively there are studies that suggest such techniques are beneficial. For example, breathing retaining is part of the Stress Innoculation Training (SIT; Meichenbaum; 1974), which has been effectively used with rape victims with PTSD (e.g., Veronen & Kilpatrick, 1983). Thought stopping, another derivative of suppression, is also a component of numerous therapies for anxiety disorders. A key distinction between these disparate findings may lie in the intention in which a technique is employed in treatment and how the client is educated as to how and when to use the skills. For example, techniques such as breathing retaining may be beneficial to individuals with anxiety disorders if they are taught to use this skill as a relaxation technique rather than an avoidance or distraction technique. Clearly, there are many unknowns in this literature suggesting areas of future work.

In short, there is theoretical (e.g., Barlow et al., 2004; Mennin et al., 2003), experimental (e.g., Cambell-Sills et al., 2003; Craske et al., 1990; Feldner et al., 2003; Lynch et al., 2001; Roemer et al., 2001), and clinical (e.g., Schmidt et al., 2000) evidence generally suggesting the maladaptive nature of suppression, specifically in an anxiety disordered population. Suppression, while theoretically employed in efforts to decrease emotional experiencing, appears to paradoxically increase symptoms of anxiety and distress.

Reappraisal—In an undergraduate sample with claustrophobia, Kamphuis and Telch (2000) investigated the incremental validity of adding antecedent threat reappraisal to exposure trials. Participants in the reappraisal group prior to entering the testing chamber were instructed

to identify a core fear and find evidence for disconfirming that fear, prior to elicitation of negative emotion. Results indicated that if antecedent-focused reappraisal occurs prior to elicitation of negative affect associated with the specific fear that the subsequent negative emotion is less intense, as measured by subjective units of distress, and further, that exposure is more effective. Those in the reappraisal group had higher end state functioning than did those who received exposure alone. Moreover, this study yielded clinically significant results in that more participants in the reappraisal group following the exposure trials would not have met study criteria, as compared to those who only received exposure. While the utilization of reappraisal may appear to be a cognitive rather than an emotion regulation technique, the subtle difference lies in that the antecedent reappraisal occurred before the participant entered the emotion-evoking situation. Further, this technique had subsequent beneficial effects on the generated emotion suggesting it was in fact regulated. Additionally, in a biological challenge study of suppression, reappraisal was accidentally investigated (Fledner et al., 2003). Participants were instructed to either suppress or observe the effects of the carbon dioxide. During the manipulation check it was discovered that most participants in the observation group, who faired better in the challenge, actually employed reappraisal. The beneficial effects of this technique are promising and warrant systematic study.

Additional Strategies—While most experimental and cognitive studies on anxiety disorders were not conducted with the specific goal of addressing emotion regulation processes, findings yielded from these literatures are relevant to the discussion of emotion regulation. A replicated finding across anxiety disorders is that individuals with an anxiety disorder, in comparison to healthy controls, are more likely to rate negative outcomes as possible (Mathews & MacLeod, 1994). This possibly suggests a deficiency in cognitive change strategies, a form of antecedent-focused emotion regulation. This represents an empirical question in need of attention. Another line of research that likely implicates an emotion regulation deficiency in this population is attentional biases to threat stimuli (Kring & Werner, 2004). It has been demonstrated through a number of methodologies that those with anxiety disorders often display biases in regards threatening stimuli more so than do nonclinical individuals. This has been found in disorders such as PTSD and Specific Phobias (e.g., Bryant & Harvey, 1995). One form of emotion regulation is attentional deployment. It is possible that those with an anxiety disorder cannot utilize this strategy effectively and therefore exhibit attentional biases.

Neurobiological Markers of Emotion Regulation

Vagal Tone

Gross (1998) defines attentional deployment as a form of antecedent-focused emotion regulation in which aspects of the situation are focused on over others to regulate emotional impact. As individuals with anxiety disorders are thought to be hypervigilant to threat cues (Barlow, 1991) this regulation strategy is likely implicated. Further, it is possible that inflexibility in use of this strategy can contribute to anxiety disorders. It has been suggested that the autonomic nervous system is involved is regulation of emotion (Thayer, Friedman, Borkovec, Johnsen & Molina, 2000). Theoretically, since cardiac vagal tone, as measured by heart rate variability, quantifies the effectiveness of central-peripheral neural feedback systems, it can serve as an index of emotion regulation ability in the sense that it represents physiological flexibility. This flexibility, signified by high vagal tone, can allow the individual to better selectively attend to aspects of situations, and also enables adaptable responses (Thayer & Lane, 2000). Conversely, low vagal tone is related to poor regulation. These findings afford a dependent variable, vagal tone, by which the autonomic nervous system substrates of emotion regulation can be studied.

In a review of vagal tone studies in a panic disorder population, Friedman and Thayer (1998) reported that lower vagal tone was related to not only the cardiac symptoms of panic attacks but also related to poor attentional control away from threat cues. In Gross's (1998) terms, attentional deployment is deemed a mode of emotion regulation. Therefore, those with panic disorder are lacking in application of this technique, thereby possibly contributing to their disorder.

Thayer and Lane (2000) stated this pattern of low vagal tone is apparent in GAD. In a study of worry, a cardinal symptom of GAD, baseline phase measures and worry phase measures of vagal tone were collected for a GAD group and a healthy control group (Thayer, Friedman, & Borkovec, 1996). GAD participants had lower vagal tone across both phases of the study than did the control group. Further, vagal tone during the worry phase was lower than it was during the baseline phase in both groups, suggesting that worry, a cardinal symptom of GAD served to deplete physiological regulating resources. The authors reported that these results imply a regulating deficiency in those with GAD that is furthered by worry, a key symptom of the disorder. Not only is vagal tone a potential measure of emotion regulation, it may be a marker of treatment success. In comparison to pre-treatment, individuals with GAD had increased vagal tone after a course of cognitive-behavioral treatment (as cited in Barlow et al., 2004).

Neural Substrates

Davidson (1998) posited that nearly all types of affective disorders involve an aberration in emotional processes that will be apparent at the biological level. He theorized that these abnormalities are specific to the disorder. Scientific advances, such as noninvasive functional neuroimaging, have afforded the ability to investigate the neural mechanisms involved in automatic and strategic processing of emotional stimuli (Hariri, Mattay, Tessitore, Fera, & Weinberger, 2003). Although these investigations are in their infancy, findings from numerous methodologies can be taken together to make tentative conclusions regarding neural aspects of emotion generation and regulation.

Brain lesions have afforded rich data on the association between brain operation and emotion. For example, depression is associated with lesions in the left frontal region, and in contrast, anxiety is associated with lesions in the right frontal region (as cited in Davidson, 1998).

Another methodology for studying the neurological substrates of emotion deficits in forms of psychopathology is to use healthy controls as a basis for comparison. Davidson, Marshall, Tomarken, and Henriques (1997) conducted a study in which social phobic individuals with a public-speaking fear and healthy controls were told they were required to give a speech, and exposed to an audio-recorded message that counted-down the time until they were to perform. Brain activity was recorded via electroencephalogram measures and findings revealed that in comparison to their resting baseline, during the anticipation phase social phobics displayed an increase in right-sided activation in the prefrontal and parietal regions. Moreover, this pattern of activation was not found in the control group, indicating that right-sided activation is related to anxiety. Self-report of anxiety and heart rate were also collected. Social phobics reported increased anxiety during anticipation in comparison to baseline, whereas controls did not. Further, heart rate elevations mirrored self-reported anxiety in social phobics, and a group difference was found in that social phobics had a higher heart rate than controls in both the baseline and anticipation phases.

An additional line of research involves the amygdala and the associated interconnections that mediate physiologic and behavioral effects of emotions. In terms of anxiety and depression, nonspecific results have been found in regards to activation of the amygdala, meaning that activation may be a common constituent in both disorders (Davidson, 1998). In other words, it is possible that activation of the amygdala is related to emotion elicitation in general. It

appears that the interactions between the amygdala and the cortical systems, most notably the prefrontal cortices, are implicated in modulation of emotion. Examination of the structural connections between the amygdala and cortical areas suggests the amygdala is positioned to impart influence over the prefrontal cortical output, whereas the prefrontal cortical connections to the amygdala are for the most part inhibitory (Hariri et al., 2003). Specifically, the amygdala possesses projections terminating in the feedback layers of the prefrontal cortex. Beauregard, Levesque, & Bourgouin (2001) provided evidence via functional neuroimaging that the right prefrontal cortical regions play a key role in transforming emotional input from the amygdala. Furthermore, since the cortical systems show differentiation between depression and anxiety, it could be inferred that such systems are related to modulation of the nonspecific negative affect generated in the amygdala (Davidson).

Hariri et al. (2003) examined this possibility in a group of healthy controls via exposure to threatening pictorial images and functional neuroimaging. Two types of trials were conducted. The first entailed the participant matching the target image to one of two comparison images. This was used to evoke an amygdala response alone, as cognitive processing of the image was not necessary. Results for these trials indicated a bilateral amygdala response, and little to no cortical activity. The second trial type was labeling, in which the participant was to say if the target image was a natural threat (e.g., snake) or an artificial threat (e.g., gun). This condition was intended to evoke cognitive processing of the threatening stimuli. Results yielded from these trials indicated an attenuation of amygdala response and subsequent activation in the right prefrontal cortex and anterior cingulate cortex. These results suggest that the prefrontal cortical regions are involved in regulation of amygdala generated emotion during conscious evaluation of threat-evoking stimuli. Of note is that this data came from a sample of healthy controls, not a clinical sample. Therefore, generalization of these results to an anxiety disorder population is not warranted. The authors did posit that deficiencies or defects in the functioning of the implicated brain regions may contribute to emotional disorders. In sum, these results are promising and deserve empirical attention in a clinical sample.

Collectively, affective neuroscience has afforded promising findings in terms of emotion and psychopathology in general. As these lines of research are in the early stages, and because of the difficulty in distinguishing emotion generation from regulation, it is unclear as to whether the neural substrates of anxiety disorders known to date reflect an irregularity in emotion generation, regulation, or both. Further investigation is needed to elucidate these findings.

Shortcomings and Future Directions for Emotion Regulation Research

While many have already concluded that anxiety disorders in part reflect deficiencies in emotion regulation processes (e.g., Barlow et al., 2004), this may be premature. There is a relative lack of published empirical studies in this area. Further there are methodological confounds found in some of the work. Studies often use outcome variables such as differences in intensity of emotion measured via self-report or facial expression as evidence of emotion regulation processes. Without taking into account individual differences in affective chronometry, which is seldom done, the conclusions of such studies are likely incomplete. Therefore, assessment of individual differences in emotion experience, intensity, threshold, and so forth should be given to control for these variables. Furthermore, assuming an emotion has been regulated implicates that it differs from its unregulated form. Without knowing the course of the unregulated emotion, assuming regulation is premature. Much like baseline measures are routinely collected in studies utilizing physiological measures, baseline accounts of unregulated emotion need to be part of regulation studies. Future research would benefit from the use of longitudinal designs to examine developing trends in the relationships among symptoms and emotion regulation strategy implementation, as well as the effects of treatment. It would be helpful to examine the choice of emotion regulation strategy and frequency of use

in response to general stressors and disorder specific stressors, and the unfolding impact of such use. Additionally, future work should investigate possible moderators of emotion regulation strategy use among clinical samples. Emotion regulation strategies may be useful in some situations and harmful in others, and identification of variables that account for this is needed. It is unlikely that an emotion regulation strategy is inherently flawed, and therefore data that reveals the factors that lead to the success or failure of a strategy is warranted. Despite these difficulties, the research in this area is promising and has clinical implications.

Treatment Implications

Within the last 50 years there has been a focus on the behavioral and cognitive components of emotional disorders, and while this focus has led to knowledge that enhanced treatments of these ailments, it may have led to other important processes, such as emotion regulation, being overlooked. It has been established that, "people not only have emotions, they also handle them." (Frijda, 1986, p. 401), and the means by which they handle them is becoming a focus of treatments. Although the scientific understanding of the role of emotion regulation in psychopathology is still under development, current empirically supported therapies have already employed techniques based on the tenant that psychological discomfort can be alleviated by altering the way individuals handle their emotions (e.g., Linehan, 1993).

The acceptance- and mindfulness-oriented therapies have directly addressed emotion regulation. At first glance, acceptance appears to be the antithesis of regulation. The theoretical basis of many of these acceptance based therapies such as Dialectical Behavior Therapy (DBT; Linehan, 1993) and Acceptance and Commitment Therapy (ACT; Hayes et al., 1999) is that there is a tendency in forms of psychopathology to avoid emotional experiences by counterproductive attempts at over-regulation. As emotion regulation may be automatic or purposeful (Gross, 1998), these avoidance attempts may be so entrenched within one's behavioral repertoire that they go unnoticed. Mindfulness, by definition, is becoming an "observer" of one's emotions and thoughts (Linehan). It is key that observation occurs without attempts of modification of emotions or thoughts, this is termed radical acceptance. Radical acceptance of internal events dissuades against maladaptive attempts of regulation and allows for more flexible responses. Mennin (2004) also implemented acceptance of emotions into his therapy for GAD. DBT additionally utilized the concept of modifying action tendencies in the technique termed "opposite to emotion." This skill requires the conscious recognition of an action tendency and subsequent conscious decision to act in a direction opposite to that the original emotion suggests.

Implementation of emotion regulatory framework in treatment has also been done by Barlow and colleagues (2004). They suggested a unified treatment for emotional disorders that has three elements, all of which can be conceptualized through an emotion regulation framework. The first component is alteration of antecedent reappraisals, which maps nicely onto Gross's (1998) reappraisal technique. The second component is prevention of emotional avoidance. As suppression is a technique aimed at avoidance, this aspect of the treatment entails encouraging decreased use of a maladaptive strategy. The last component is facilitating action tendencies not associated with the emotion of concern, which seems very similar to the opposite to emotion skill in DBT. These three treatment components are all aimed at either decreasing use of maladaptive strategies or increasing use of adaptive strategies.

Specific findings, though it is premature to make definitive statements, have clinical implications. For example, emotional numbing within PTSD may not necessarily implicate encouragement of emotional experiencing as a whole, as negative emotions are experienced. Rather, positive emotional experiencing seems to be the deficit deserving of clinical attention.

Additionally, reappraisal in addition to exposure was efficacious for fear reduction in those with a specific phobia (Kamphuis & Telch, 2000), suggesting the utility of this technique.

Furthermore, research findings from healthy controls may have implications for treatment as well. For example, it has been demonstrated that when negative emotion eliciting stimuli are presented, those who are instructed to engage in antecedent emotion regulation by altering their appraisals of threat and negativity respond with salutary effects (Gross, 1998). In short, regulation attempts before the emotion is fully elicited led to decreased subjective experience of negative emotion. Incorporation of this finding into treatment may be beneficial.

Summary and Conclusion

In conclusion, despite the inherent relationship between anxiety disorders and emotion deficits, there is a relative lack of studies examining emotion regulation within clinical samples of anxiety disorders. With the exclusion of suppression and reappraisal, specific strategies have not been investigated. There is adequate evidence of the maladaptive nature of suppression use (e.g., Cambell-Sills et al., 2003; Lynch et al., 2001; Roemer et al., 2001), and limited evidence of the beneficial effects of reappraisal (e.g., Feldner et al., 2003; Kamphuis & Telch, 2000). Further, tentative inferences can be made from studies not attempting to directly study emotion regulation. For example, the use of attentional deployment may be a skill deficit in those with anxiety disorders (e.g., Bryant & Harvey, 1995). Biological psychology has afforded outcome measures that index emotion regulation, such as vagal tone. Findings using this methodology suggest those with anxiety disorders have lower vagal tone (e.g., Thayer et al., 2000), implicating less flexibility in attentional selection and responding to situations adaptively. There is also preliminary evidence that increases in vagal tone pre- to post-treatment may be a marker of successful treatment outcome (as cited in Barlow et al., 2004). Lesion studies implicate the right cortical regions in anxiety disorders (e.g., Davidson, 1998). Activation of the amygdala appears to be associated with automatic emotion generation and the prefrontal cortical regions are implicated in the regulation of generated emotion (e.g., Beauregaurd et al., 2001; Hariri et al., 2003). Lastly, implementation of emotion regulation skills in a therapeutic context appears promising (e.g., Hayes et al., 1999; Linehan, 1993). Collectively, these findings underscore the likelihood of emotion regulation playing a key role in etiology and maintenance of anxiety disorders, although more research is needed to elucidate the specifics.

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